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FORTRAN

**CATEGORY: SOFTWARE STANDARD
SUBCATEGORY: PROGRAMMING LANGUAGE**

FIPS PUB 69-1

U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, *Secretary*
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

Foreword

The Federal Information Processing Standards Publication Series of the National Bureau of Standards is the official publication relating to standards adopted and promulgated under the provisions of Public Law 89-306 (Brooks Act) and under Part 6 of Title 15, Code of Federal Regulations. These legislative and executive mandates have given the Secretary of Commerce important responsibilities for improving the utilization and management of computers and automatic data processing in the Federal Government. To carry out the Secretary's responsibilities, the NBS, through its Institute for Computer Sciences and Technology, provides leadership, technical guidance, and coordination of Government efforts in the development of guidelines and standards in these areas.

Comments concerning Federal Information Processing Standards Publications are welcomed and should be addressed to the Director, Institute for Computer Sciences and Technology, National Bureau of Standards, Gaithersburg, MD 20899.

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Abstract

This publication announces the revision of Federal Information Processing Standard FORTRAN. This revision supersedes FIPS PUB 69 and reflects changes to the Objectives, Applicability, and Implementation portions of FIPS FORTRAN. FIPS FORTRAN is the adoption of American National Standard Programming Language FORTRAN, X3.9-1978. The American National Standard specifies the form and establishes the interpretation of programs expressed in the FORTRAN programming language. The standard consists of a full language and a subset language. The purpose of the standard is to promote portability of FORTRAN programs for use on a variety of data processing systems. The standard is used by implementors as the reference authority in developing compilers, interpreters, or other forms of high level language processors, and by other computer professionals who need to know the precise syntactic and semantic rules of the standard.

Key words: data processing; Federal Information Processing Standards Publication; FORTRAN; numeric methods; programming language; scientific computing engineering; software; standards.

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Federal Information Processing Standards Publication 69-1

1985 December 24

Announcing the Standard for

FORTRAN



Federal Information Processing Standards Publications (FIPS PUBS) are issued by the National Bureau of Standards pursuant to Section 111 (f) (2) of the Federal Property and Administrative Services Act of 1949, as amended, Public Law 89-306 (79 Stat. 1127), Executive Order 11717 (38 FR 12315, dated May 11, 1973), and Part 6 of Title 15 Code of Federal Regulations (CFR).

1. **Name of Standard.** FORTRAN (FIPS PUB 69-1)
2. **Category of Standard.** Software Standard, Programming Language.
3. **Explanation.** This publication announces the revision of Federal Information Processing Standard FORTRAN. This revision supersedes FIPS PUB 69 and reflects changes to the Objectives, Applicability, and Implementation portions of FIPS FORTRAN. FIPS FORTRAN is the adoption of American National Standard Programming Language FORTRAN, X3.9-1978. The American National Standard specifies the form and establishes the interpretation of programs expressed in the FORTRAN programming language. The standard consists of a full language and a subset language. The purpose of the standard is to promote portability of FORTRAN programs for use on a variety of data processing systems. The standard is used by implementors as the reference authority in developing compilers, interpreters, or other forms of high level language processors, and by other computer professionals who need to know the precise syntactic and semantic rules of the standard.
4. **Approving Authority.** Secretary of Commerce.
5. **Maintenance Agency.** Department of Commerce, National Bureau of Standards (Institute for Computer Sciences and Technology).
6. **Cross Index.** American National Standard Programming Language FORTRAN, X3.9-1978.
7. **Related Documents.***
 - a. Federal Information Resources Management Regulation 201-8.1, *Federal ADP and Telecommunications Standards*.
 - b. Federal Information Processing Standards Publication 29, *Interpretation Procedures for Federal Information Processing Standard Programming Languages*.
 - c. NBS Special Publication 500-117, *Selection and Use of General-Purpose Programming Languages*.
8. **Objectives.** Federal standards for high level programming languages permit Federal departments and agencies to exercise more effective control over the production, management, and use of the Government's information resources. The primary objectives of Federal programming language standards are:
 - to encourage more effective utilization and management of programmers by insuring that programming skills acquired on one job are transportable to other jobs, thereby reducing the cost of programmer re-training;
 - to reduce the cost of program development by achieving the increased programmer productivity that is inherent in the use of high level programming languages;
 - to reduce the overall software costs by making it easier and less expensive to maintain programs and to transfer programs among different computer systems, including replacement systems;

* Refers to most recent revision of FIPS PUB.

- to protect the existing software assets of the Federal Government by insuring to the maximal feasible extent that Federal programming language standards are technically sound and that subsequent revisions are compatible with the installed base.

Government-wide attainment of the above objectives depends upon the widespread availability and use of comprehensive and precise standard language specifications.

9. Applicability.

a. Federal standards for high level programming languages should be used for computer applications and programs that are either developed or acquired for government use. FIPS FORTRAN is one of the high level programming language standards provided for use by all Federal departments and agencies. FIPS FORTRAN is especially suited for: (1) the generation of programs to solve recurrent numerical, scientific and engineering problems, particularly those which depend upon efficient computation or access to mathematical or statistical libraries of subprograms; (2) the efficient implementation of algorithms on a wide range of computing equipment of varying power and structure.

b. The use of FIPS high level programming languages is strongly recommended when one or more of the following situations exist:

- It is anticipated that the life of the program will be longer than the life of the presently utilized equipment.
- The application or program is under constant review for updating of the specifications, and changes may result frequently.
- The application is being designed and programmed centrally for a decentralized system that employs computers of different makes, models and configurations.
- The program will or might be run on equipment other than that for which the program is initially written.
- The program is to be understood and maintained by programmers other than the original ones.
- The advantages of improved program design, debugging, documentation and intelligibility can be obtained through the use of this high level language regardless of interchange potential.
- The program is or is likely to be used by organizations outside the Federal Government (i.e., State and local governments and others).

c. Non-standard language features should be used only when the needed operation or function cannot reasonably be implemented with the standard features alone. Although non-standard language features can be very useful, it should be recognized that their use may make the interchange of programs and future conversion to a revised standard or replacement processor more difficult and costly.

d. It is recognized that programmatic requirements may be more economically and efficiently satisfied through the use of statistical or numerical software packages. The use of any facility should be considered in the context of system life, system cost, data integrity, and the potential for data sharing.

e. Programmatic requirements may be also more economically and efficiently satisfied by the use of automatic program generators. However, if the final output of a program generator is a FORTRAN source program, then the resulting program should conform to the conditions and specifications of FIPS FORTRAN.

10. Specifications. FIPS FORTRAN specifications are the language specifications contained in American National Standard Programming Language FORTRAN, X3.9-1978. The FORTRAN standard describes two levels of the FORTRAN language. FORTRAN refers to the full language and Subset FORTRAN refers to the subset of the full language.

The X3.9-1978 document specifies the form of a program written in FORTRAN, formats of data for input and output, and semantic rules for program and data interpretation.

The standard does not specify limits on the size or complexity of programs, the range or precision of numeric quantities or the method of rounding of numeric results, the results when the rules of the standard fail to establish an interpretation, minimum system requirements, the means of supervisory control of programs, or the means of transforming programs internally for processing.

A facility should be available in the processor that allows a FORTRAN source program to be analyzed with respect to FIPS FORTRAN. Any statement appearing in the source program that does not conform syntactically to the specifications of FIPS FORTRAN should be explicitly identified.

11. Implementation. The implementation of FIPS FORTRAN involves three areas of consideration: acquisition of FORTRAN processors, interpretation of FIPS FORTRAN, and validation of FORTRAN processors.

11.1 Acquisition of FORTRAN Processors. This publication is effective December 24, 1985. FORTRAN processors acquired for Federal use after this date should implement FIPS FORTRAN. Conformance to FIPS FORTRAN should be considered whether FORTRAN processors are developed internally, acquired as part of an ADP system procurement, acquired by separate procurement, used under an ADP leasing management, or specified for use in contracts for programming services.

11.2 Interpretation of FIPS FORTRAN. NBS provides for the resolution of questions regarding FIPS FORTRAN specifications and requirements, and issues official interpretations as needed. All questions about the interpretation of FIPS FORTRAN should be addressed to:

Director
Institute for Computer Sciences and Technology
ATTN: FORTRAN Interpretation
National Bureau of Standards
Gaithersburg, MD 20899

11.3 Validation of FORTRAN Processors. The General Services Administration (GSA), through its Federal Software Management Support Center (FSMSC), provides a service for the purpose of validating the conformance to this standard of language processors offered for Federal procurement. The validation system reports the nature of any deviations that are detected. This service is offered on a reimbursable basis. Further information about the validation service can be obtained from the FSMSC which is located at 5203 Leesburg Pike, Suite 1100, Falls Church, VA 22041-3467 (703-756-6153).

12. Where to Obtain Copies. Copies of this publication are for sale by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161. (Sale of the included specifications document is by arrangement with the American National Standards Institute.) When ordering, refer to Federal Information Processing Standards Publication 69-1 (FIPSPUB69-1), and title. Payment may be made by check, money order, or deposit account.

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